

**REMARKS**

This Amendment responds to the Office Action dated April 21, 2006 in which the Examiner rejected claims 104-106 under 35 U.S.C. §112, second paragraph, and rejected claims 41-57 and 81-106 under 35 U.S.C. §103.

As indicated above, claims 104-106 have been amended for antecedent basis. The amendments do not narrow the literal scopes of the claims. Therefore, Applicants respectfully request the Examiner withdraws the rejection to claims 104-106 under 35 U.S.C. §112, second paragraph.

Claims 41 and 104 claim a method of forming a coated optical element, the method using a mould having first and second mould sections that will form front and back surfaces of the optical element. One of the mould sections has a casting face, the method including the steps of: a) applying a first coating layer to cover the casting face of a mould section, the casting face being capable of imparting a desired optical configuration on a surface of the optical element, wherein the first coating layer is an abrasion resistant coating layer; b) treating the first coating layer to prevent damage to the first coating layer during subsequent steps; c) applying a second coating layer to the first coating layer to substantially cover the first coating layer; d) treating the second coating layer to provide at least weak adhesion of the second coating layer to the first coating layer and to prevent damage to the second layer during subsequent steps; e) filling the mould with an organic liquid material; and f) hardening the organic liquid material so as to form the optical element adhered to the second coating layer. In claim 41 the first coating layer is an abrasive resistant coating layer comprising polysiloxane resin. The second coating layer is an intermediate coating layer comprising a (meth)acryl silane, and the (meth)acryl

silane, the organic liquid material and the abrasive resistant coating layer co-react to form the coated optical element. In claim 104, the hardening comprises co-reacting the second layer, the organic liquid material and the first coating layer. The second coating layer is between and in contact with the organic liquid material and the first coating layer to provide adhesion between the organic liquid material and the first coating layer.

Through the method of the claimed invention forming a coated optical element by applying a first coating layer to the casting face of a mold, applying a second coating layer to the first coating layer, filling the mold with an organic liquid material and then hardening the organic liquid material to form the optical element adhered to the second coating layer, as claimed in claims 1 and 104, the claimed invention provides a method of forming a coated optical element with improved adhesion between the lens and a hard coat layer. The prior art does not show, teach or suggest the invention as claimed in claims 41 and 104.

Applicants respectfully point out that one of the primary benefits of the present invention is that it enables the use of standard commercial hard coating systems in an in-mould coating process (IMC), without the need to customize a coating for IMC. At the time of the development of the present invention, two types of organic hard coatings were available, acrylate-based hard coatings and polysiloxane-based hard coats. Polysiloxane hard coats were known to provide levels of abrasion resistance superior to acrylate hard coats. Thus, polysiloxanes were considered to be premium abrasive resistant hard coats. However, at the time it was not possible to use polysiloxane hard coats in an IMC process because they did not adhere to the lens substrate. The problem that had to be solved in this case, was to enable premium

hard coating systems to be used on lenses formed by IMC. As a result of the present invention, it is now possible to use exactly the same coatings for conventional systems (i.e., coating of pre-formed lenses), as well as for IMC systems. More specifically, the present invention allows one to adhere premium polysiloxane via an in-mould coating process.

Claims 41-54, 81-85, 88-94, 97-98, and 102-106 were rejected under 35 U.S.C. §103 as being unpatentable over *Soane et al.* (U.S. Patent No. 5,733,483) in view of *Konishi et al.* (U.S. Patent No. 5,462,806).

Applicants respectfully traverse the Examiner's rejection of the claims under 35 U.S.C. §103. The claims have been reviewed in light of the Office Action, and for reasons which will be set forth below, Applicants respectfully request the Examiner withdraws the rejection to the claims and allows the claims to issue.

*Soane et al.* appears to disclose a method for forming from a mold, optical elements having an optical coating and a tinted hard coat layer. (Column 1, lines 20-22). With respect to FIG. 1, there is shown an optically coated mold, generally indicated by the numeral 10. The mold 10 comprises a front half 12 and a back half 14. (Column 4, lines 14-17). The desired optical coatings can be applied in any desired combination to each half of the mold 10. In the following illustration, all coatings are applied to both the convex and concave halves 12 and 14 in the following order. FIG. 2 is a cross sectional view of a set of preferred coatings on the front half 12. A first single coating is deposited upon the polished surface 16 of the front half 12 for forming a release layer 20. (Column 4, lines 28-36). As also seen in FIG. 2, the optical coating is applied on top of the release layer 20. In general, the optical coating is an inorganic dielectric stack. In this example, the optical coating is

a multilayer anti-reflective coating 22, high vacuum vapor deposited upon the release layer 20. (Column 5, lines 61-65). As also seen in FIG. 2, a second single coating is deposited upon the multilayer anti-reflective coating 22 for forming a coupling agent layer 32. Without this chemical coupler, a coated lens will have patches of ion extracted optical coatings. (Column 6, lines 13-17). The coupling agent layer 32 is necessary for chemical bonding of the multilayer anti-reflective coating 22, otherwise, there would be merely physical adhesion of the multilayer anti-reflective coating 22, which is easily removed with normal use and cleaning of a lens. (Column 6, lines 34-38). As also seen in FIG. 2, a third single coating is deposited upon the coupling agent layer 32 for forming a hard coat layer 34. The hard coat layer 34 is a highly crosslinked polymer that becomes almost as hard as glass and extremely scratch resistant. The hard coat 34 may be tinted. The tinted hard coat layer 34 consists of a tinting material and a primer. (Column 6, lines 59-64).

Thus, *Soane et al.* is directed to a method and apparatus for forming coatings on a mold. However, nothing in *Soane et al.* shows, teaches or suggests a first coating layer is an abrasion resistant coating layer comprising polysiloxane resin, the second coating layer is an intermediate coating layer comprising a (meth)acryl silane as claimed in claim 41 or that the hardening comprises co-reacting a first coating layer, an organic liquid material and a second coating layer and the second coating layers between and in contact with the organic liquid material and the first coating layer to provide adhesion between the organic liquid material and the first coating layer as claimed in claim 104.

Applicants respectfully point out that the role of the primer in *Soane et al.* is different from that of the present invention. The primer in the case of *Soane et al.* is

used to couple an acrylate hard coating to a AR coating. An acrylate hard coating does not require a primer to promote adhesion between the lens substrate and the hard coating. Applicants respectfully submit that a person skilled in the art knows that an acrylate hard coating does not need a primer and therefore there is no motivation to use an adhesive primer in a IMC process outlined by *Soane et al.* Therefore, *Soane et al.* does not show, teach or suggest the provision of an adhesion primer to adhere a hard coating to a substrate with a IMC process.

Additionally, nothing in *Soane et al.* shows, teaches or suggests polysiloxane hard coatings even though they were known at the time. This indicates that a person of ordinary skill in the art did not consider polysiloxane hard coatings were appropriate coatings for a IMC process. Furthermore, since *Soane et al.* discloses the use of the abrasive resistant acrylate hard coating, indicates that the polysiloxane hard coating was not appropriate coating for a IMC process. Thus, nothing on *Soane et al.* shows, teaches or suggests the correct order of the layers or the specific layer chemistry as claimed in claims 41 and 104 (i.e., allyl lens substrate-(meth)acrylsilane primer layer-siloxane hard coat).

*Konishi et al.* appears to disclose a plastic lens which is excellent in adhesiveness of coated films, scratch resistance, impact resistance, resistance to chemicals, weather resistance and reflection preventing property. (Column 1, lines 44-48). A plastic lens comprises a plastic lens base material having provided on at least one surface thereof a primer layer and a hard coat layer in this order. (Column 1, lines 53-55). The primer layer comprises a polyurethane resin containing at least one organosilicon compound represented by the general formula (I) or a hydrolyzate thereof. (Column 2, lines 10-12). The primer layer is an impact absorbing layer

formed on at least one surface of the plastic lens base material comprises a resin containing the compound A, and, therefore, when a hard coat layer as a scratch resistant layer is laminated on the surface of the primer layer, the impact resistance of the plastic lens can be improved without adversely affecting the scratch resistance of the hard coat layer. (Column 2, lines 19-26). In producing the plastic lens, at least one surface of the plastic lens base material is coated with a primer coating material comprising a resin having added thereto a compound A for forming a primer layer which functions as an impact absorbing layer, and the coated base is then subjected to a curing treatment. (Column 7, lines 22-27). Methods for coating the primer coating material are not limited, and can be conventional methods such as a spin-coating method, a dipping method, a spray method or the like. If necessary, it is desirable to subject the plastic lens base material to a pretreatment such as an alkali treatment, a plasma treatment and a ultraviolet ray treatment prior to the coating in order to improve the coatability of the primer layer. After coating the primer coating material, the resulting primer layer is solidified or cured by a curing method which is considered most suitable to the primer coating material used, for example, by allowing it to stand or by conducting heat-curing, photo-curing or electron beam curing, whereby a uniform coating film can be formed. Then, a hard coat layer as a scratch resistant layer is provided on the surface of the primer layer. A hard coat agent used for the hard coat layer is preferably a resin selected from silicone, melamine and acryl resins diluted with a solvent. (Column 7, lines 37-55). After applying the hard coat agent, the coated layer is subjected to a curing treatment which is considered most suitable to the hard coat agent used, for example, by heat-curing, ultraviolet ray curing, electron beam curing or the like. Also, when a single or

multiple layer of the reflection preventing film is provided on the surface of the hard coat layer, a metal, or an oxide or fluoride of a metal or semimetal, for example, a metal oxide such as  $\text{SiO}_2$  and  $\text{ZrO}_2$  or  $\text{MgF}_2$  can be deposited by a conventional method such as a vapor-deposition method, a sputtering method, an ion plating method, an ion beam assist method or the like. (Column 7, line 60 through Column 8, line 4).

Thus, *Konishi et al.* discloses a method using a pre-formed lens, coating the performed lens with a primer layer, coating the primer layer with a hard layer and finally coating the hard layer with reflective preventive layers. Nothing in *Konishi et al.* shows, teaches or suggests applying a first coating layer to a casting face of a mould, applying a second coating layer to the first coating layer, filling the mould with an organic liquid material to form the optical element as claimed in claims 41 and 104. Rather, the processes disclosed in *Konishi et al.* would take place after the lens is formed.

Furthermore, *Konishi et al.* is directed to increasing the scratch resistance of a lens having an impact resistance primer layer (Column 2, lines 10-12, 19-26). In particular, *Konishi et al.* merely discloses a primer layer that is a urethane-based impact resistant layer that is modified by adding a sufficient silane compound to improve the hardness of the primary layer (Column 2, lines 48-56). Nothing in *Konishi et al.* shows, teaches or suggests a method of forming a coated optical element using a mould coated as claimed in claims 41 and 104.

Applicants respectfully submit that nothing in *Konishi et al.* shows, teaches or suggests an in-mould process or the specific layer chemistry as claimed in claims 41 and 104 (i.e., allyl lens substrate-(meth)acrylsilane primer layer-siloxane hard coat).

Additionally, Applicants respectfully point out that Examples 1-7 of *Konishi et al.* are all examples using a urethane-based primer layer. Urethanes are widely used to promote impact resistance in impact resistance primer layers. In Examples 1-4 and 6, the primer layer also contains glycidoxypyrroltrimethoxysilane (or hydrosylate thereof). The silane is used in small amounts to increase the abrasion resistance of the impact resistance primer layer. Nothing in *Konishi et al.* shows, teaches or suggests using a primer layer having double bonds that are able to co-react with the double bonds of the lens substrate, as claimed in the present invention in which a substrate having allyl double bonds (CR39). Nothing in *Konishi et al.* shows, teaches or suggests to a person skilled in the art to co-react double bonds of the lens substrate with double bonds in an adhesion primer layer because there are no double available in the *Konishi et al.* system because the lens substrate is a fully cured CR39 system as a preformed lens. Thus, none of the examples in *Konishi et al.* uses a primer with double bonds. Accordingly, nothing in *Konishi et al.* shows, teaches or suggests a lens substrate-primer layer chemistry as claimed in claims 41 and 104.

Furthermore, Applicants respectfully point out that the primers in *Konishi et al.* serve a different function than the primer of the present invention. The function of the primer of the present invention is to provide adhesion between the lens substrate and the polysiloxane hard coatings. The function of the primer in *Konishi et al.* is to provide impact enhancement. The coatings used in *Konishi et al.* do not require a primer to promote adhesion between the hard coating and the substrate. The fact *Konishi et al.* teaches one that it is necessary to pretreat the surface to effect



adhesion of the primer coating to the substrate teaches against the use of a primer for adhesion promotion.

A combination of *Konishi et al.* with *Soane et al.* would not be possible since *Konishi et al.* is directed to forming an impact resistant, primary layer on a preformed lens by traditional liquid coatings such as dip coating and spin coating techniques. Nothing in *Konishi et al.* show, teach or suggest an in mould coating process nor is there any suggestion as to why these traditional methods would be used with *Soane et al.* In fact, *Konishi et al.* teach away from *Soane et al.* since *Konishi et al.* form coatings on pre-formed lenses using traditional coating techniques. Furthermore, neither *Soane et al.* nor *Konishi et al.* show, teach or suggest the specific layer chemistry (i.e., allyl lens substrate-(meth)acrylsilane primer layer-siloxane hard coat) as claimed in claims 41 and 104.

Additionally, *Konishi et al.* disclose the formation of a primer layer on a manufactured lens. The skilled person will understand that the surface of such a lens needs to be modified before a primer layer is added in order for the primer layer to adhere to the lens. This is evident in the disclosures of *Konishi et al.* (Column 7, line 40 to line 44; Column 8, line 31 to line 33). The modification is usually by chemical or physical etching. This pre-treatment is necessary because the surface of a preformed lens has no polymerisable groups (double bonds or groups containing suitable heteroatoms) with which the primer layer material can react to adhere the primer layer to the surface of the lens. The pretreatment steps disclosed in *Konishi et al.* etch the surface of the lens and provide free —OH groups with which the urethane primer layer can react or otherwise bond.

The present invention arose from a desire to form hard coated lenses using an in mould coating process. However, this desire could not be fulfilled by simply applying existing coating techniques for preformed lenses, to in mould coating. The main reason is that an in mould coating process involves formation of the lens as the last step. Therefore, pre-polymeric or monomeric lens material needs to be added to a mould containing the coating layers in a suitable configuration. Furthermore, there was also a difficulty in getting a hard coat layer to adhere to the lens using an in mould coating process. The present invention overcame this problem by providing a primer layer which enhances adhesion between the lens and the hard coat layer. This is done using a (meth)acryl silane primer layer. There is no teaching or suggestion whatsoever in *Konishi et al.* to increase adhesion between a hard coat layer and a lens in an in mould coating process using a (meth)acryl silane. Hence there would be no motivation whatsoever for the skilled person to combine the disclosure of *Konishi et al.* and *Soane et al.* Indeed, it appears that it is only with the aid of hindsight that one is able to make the combination suggested by the Examiner.

When one considers the chemistry at the interface between the lens and the primer layer, it is evident that the person skilled in the art would not combine the disclosures of *Soane et al.* with *Konishi et al.* The processes described in *Konishi et al.* require the surface of a preformed lens to be etched to provide free —OH groups. It is these —OH groups that cross react with the urethane resin of the impact resistant primer layer in each case to enable the primer layer to adhere to the lens. This etching process is not possible with an in mould coating process. Therefore, there is nothing in *Konishi et al.* that would lead, direct or suggest to the skilled

person that the chemistry used in the described processes could be used in an in mould coating process. Accordingly, the present inventors had to develop new procedures using different chemistry suitable for an in mould coating process. In the process of the present invention, the chemistry at the interface between the primer layer ((meth)acryl silane in a semi-cured form) and the pre-polymeric lens material is very different to that of *Konishi et al.* In the case of the present invention, adhesion of the primer layer to the lens is enhanced by cross reaction of the double bonds of a the (meth)acryl silane groups of the primer layer composition, with the double bonds of the lens material. There is no disclosure in *Konishi et al.* that would direct a skilled person to consider this chemistry. Consequently, even if the skilled person *arguendo* were to combine *Konishi et al.* and *Soane et al.* (which is not conceded) they would not have developed a lens according to the present invention.

For all the above stated reasons, Applicants respectfully request the Examiner withdraws the rejection to claims 41 and 104 under 35 U.S.C. §103.

Claims 42-54, 81-85, 88-94, 97-98, 102-103 and 105-106 depend from claims 41 and 104 and recite additional features. Applicants respectfully submit that these claims would not have been obvious within the meaning of 35 U.S.C. §103 over *Soane et al.* and *Konishi et al.* at least for the reasons as set forth above. Therefore, Applicants respectfully request the Examiner withdraws the rejection to claims 42-54, 81-85, 88-94, 97-98, 102-103 and 105-106 under 35 U.S.C. §103.

Claims 55-57 were rejected under 35 U.S.C. §103 as being unpatentable over *Soane et al.* and *Konishi et al.* and further in view of *LaLiberte et al.* (U.S. Patent No. 4,273,809). Claims 86-87 and 95-96 were rejected under 35 U.S.C. §103 as being unpatentable over *Soane et al.* and *Konishi et al.* and further in view of *Singh et al.*

(U.S. Patent No. 5,204,126). Claims 99-101 were rejected under 35 U.S.C. §103 as being unpatentable over *Soane et al.* and *Konishi et al.* and further in view of *Takamizawa et al.* (U.S. Patent No. 5,096,626).

Applicants respectfully traverse the Examiner's rejection of the claims under 35 U.S.C. §103. The claims have been reviewed in light of the Office Action, and for reasons which will be set forth below, Applicants respectfully request the Examiner withdraws the rejection to the claims and allows the claims to issue.

As discussed above, since nothing in *Soane et al.* and *Konishi et al.* show, teach or suggest the primary features as claimed in claims 41 and 104, Applicants respectfully submit that the combination of the primary references with the secondary references to *LaLiberte et al.*, *Singh et al.* and *Takamizawa et al.* will not overcome the deficiencies of the primary references. Therefore, Applicants respectfully request the Examiner withdraws the rejection to claims 55-57, 86-87, 95-96 and 99-101 under 35 U.S.C. §103.

The prior art of record, which is not relied upon, is acknowledged. The references taken singularly or in combination do not anticipate or make obvious the claimed invention.

Thus it now appears that the application is in condition for reconsideration and allowance. Reconsideration and allowance at an early date are respectfully requested.

If for any reason the Examiner feels that the application is not now in condition for allowance, the Examiner is requested to contact, by telephone, the Applicants' undersigned attorney at the indicated telephone number to arrange for an interview to expedite the disposition of this case.

In the event that this paper is not timely filed within the currently set shortened statutory period, Applicants respectfully petition for an appropriate extension of time. The fees for such extension of time may be charged to our Deposit Account No. 02-4800.

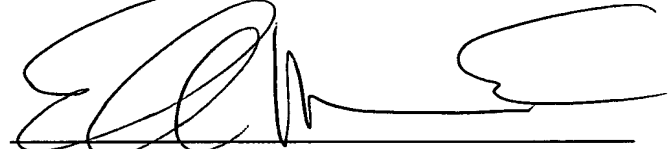
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Respectfully submitted,

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